REMARKS

The disclosure is objected to because of the following informalities: on page 5, line 22, the element number "14" is not shown in Figure 1.

Figure 1 has been corrected to show element 14, the beam splitting and combining portion.

Claims 1-18 are pending in this application.

Claims 1-4 and 6-18 are rejected under 35 USC 102(e) as being anticipated by Myatt et al. (US 6,621,580).

With regard to claims 1, 7, 13, 17, 18: Myatt is said to disclose an interferometer comprising a beam splitter and combiner (12) for splitting an input beam (16) into two sub-beams (20, 22); a first arm having a length L1 optically coupled to the beam splitter and combiner (28), said first arm defining a first path within a first material having a refractive index n1 and a coefficient of expansion alpha1 (col 2 lines 58-59); and a second arm having a length L2 optically coupled with the beam splitter and combiner (24), said second arm defining a second path within a second material having a refractive index n2 and a coefficient of expansion alpha 2 (col 2, lines 58-59) the lengths of the two arms are selected such that they satisfy the claimed equation and claimed specifications for the first arm and the second arm to provide a substantially athermal structure (col 2 lines 62-63).

The applicant fails to see any correspondence between the claims of the instant invention and the disclosure of Myatt in the cited reference.

For example:

The instant invention claims an interferometer comprising a beam splitter and combiner for splitting an input beam into two sub-beams and for combining two sub-beams into a single beam.

Myatt does not appear to have a beam splitter and combiner for splitting and for combining. He utilizes his splitter as such, a beam splitter.

Myatt does not disclose having a first arm defining a first path with a coefficient of expansion alpha 1 and a refractive index n1 and a second arm defining a second path within a second material having a refractive index n2 and a coefficient of expansion alpha 2.

The examiner references col. 2, lines 58 and 59, as reciting this structure.

The applicant has reprinted col. 2, lines 52-65, of Myatt which state:

"Because a wavelength locker is a calibrated reference, its design must be insensitive to changes in the operating environment. The primary environmental concerns are temperature changes and polarization sensitivity of the beam

splitters. Temperature changes to the etalon cause changes in the optical path length of the interferometric optical element (due to the material's thermal coefficient of expansion and/or temperature-dependent refractive index), thereby changing the FSR and peak locations of the FP etalon and causing the laser to detune from the desired lock frequency. Thermally-induced changes to the etalon may be mitigated by constructing the etalon from temperature-insensitive materials, applying direct temperature control to the wavelength locker, or both."

Myatt (above) teaches what is well known in the art. That temperature changes to the etalon cause changes in the optical path length of the interferometric optical element due to the material's coefficient of expansion and/or temperature dependent refractive index.

He then makes the statement that "thermally-induced changes to the etalon may be mitigated by constructing the etalon from temperature-insensitive materials, applying direct temperature control to the wavelength locker, or both."

This is in no way a teaching or even a suggestion of the applicant's elegant solution defined in the claims.

Myatt essentially teaches the reader that to solve the problem of path length change due to temperature change, one should either construct the etalon from a temperature insensitive material or apply direct temperature control to the wavelength locker. This teaches away from the claimed invention.

The applicant teaches in the background of the invention in paragraph [4] that no such materials are known which are temperature insensitive. Hence the clever, novel and inventive solution defined by claim 1 obviates finding this unknown material by putting constraints upon L1, L1 n1, n2 and α_1 and α_2.

It is in the discovery of the particular relationship of these parameters defined by the equation in claim 1, which yields a useful invention.

Myatt made no mention of this. He simply said, in lines 56-59 that "Temperature changes to the etalon cause changes in the optical path length of the interferometric optical element (due to the material's thermal coefficient of expansion and/or temperature-dependent refractive index)". And this is a very well known problem. In fact it is a statement of a problem, not a solution to a problem.

Nowhere do Myatt et al. in U.S. Patent 6,621,580 teach:

> 1. An interferometer comprising a beam splitter and combiner for splitting an input beam into two sub-beams and for combing two sub-beams into a single beam;
> a first arm having a length l_1 optically coupled to the beam splitter and combiner, said first arm defining a first path within a first material having a refractive index n_1 and a coefficient of expansion α_1; and,
> a second arm having a length l_2 optically coupled with the beam splitter and combiner, said second arm defining a second path within a second material having a refractive

index n_2 and a coefficient of expansion α_2 wherein the lengths of the two arms are selected such that they satisfy the equation:

$$l_1\left[n_1\alpha_1+\frac{dn_1}{dT}\right]-l_2\left[n_2\alpha_2+\frac{dn_2}{dT}\right]=0 \quad .$$

There is no mention if Myatt regarding a first arm having a refractive index n_1 and a coefficient of expansion α_1 having a length l_1 optically coupled to the beam splitter and combiner, said first arm defining a first path within a first material; and, a second arm having a refractive index n_2 and a coefficient of expansion α_2 and having a length l_2 optically coupled with the beam splitter and combiner, wherein the two arms are selected such that they satisfy the equation above.

This is a novel and inventive discovery and is a solution to the problem posed by Myatt, that path length in materials changes with a change in temperature.

The instant invention doesn't rely on Myatt's suggestion of finding the mythical material that doesn't change with temperature. The instant invention provides a solution that allows for different materials to be used for each arm and wherein the resulting structure is substantially athermal without requiring Myatt's proposed temperature control.

Claim 13 defines an interferometer having a first arm of a first material having a first refractive index, a first length, and a first coefficient of expansion; and,

a second arm of a second material having a second refractive index, a second length, and a second coefficient of expansion; wherein the refractive indices, lengths and coefficients of expansion of the first arm and the second arm are selected to provide a substantially athermal structure operating at ambient temperatures. It is in the careful selection of the first refractive index, the first length and the first coefficient of expansion of the first material and the second refractive index, the second length and the second coefficient of expansion of the second material that yields a practicable solution.

Myatt on the other hand suggested something quite different. He suggests that "Thermally-induced changes to the etalon may be mitigated by constructing the etalon from temperature-insensitive materials, applying direct temperature control to the wavelength locker, or both."

The applicant's materials per se are not temperature insensitive. The resulting structure by carefully selecting lengths refractive indices and coefficients of expansions yields an interferometer that is substantially temperature insensitive.

The materials are not temperature insensitive as the applicant is not aware of any suitable materials that are temperature insensitive.

Claims 17 and 18 are said to lack novelty under 35 USC 102 (e) in view of Myatt et al.

The application would like to point out that there is no disclosure of the limitations:

A wavelocker as defined in claim 1, wherein the sign of $[n_2\alpha_2+dn_2/dT]$ is equal to the sign of $[n_2 +dn_2/dT]$.

OR

A wavelocker as defined in claim 7, wherein the sign of $[n_2\alpha_2+dn_2/dT]$ is the same as the sign of $[n_2 +dn_2/dT]$.

As has been pointed out, the equation defined in claim 1 defining the relationship between refractive index, length and coefficient of expansion of the two materials is not mentioned by Myatt et al. therefore the signs referred to in claims 17 and 18 are clearly not taught by Myatt et al.

With regard to claim 2, the examiner has cited col. 2, lines 52-61, as reciting an athermal structure. For the reasons given above, claim 2 is believed to be novel. Although the examiner has directed the applicant to Fig. 3b as being a disclosure of a Twyman-Green configuration, the applicant respectfully disagrees. Myatt makes no mention of such a configuration and the functionality described does not resemble that of a Twyman-Green configuration. There appears to be no splitting and subsequent combining to join the outputs into a single beam. Notwithstanding, the important limitations of claim 1 are absent from Myatt.

The examiner has rejected claims 3, 8, 11 in view of Myatt's structure being at least partially reflecting due to the material air interface. However, the reflecting end faces

define a Twyman-Green configuration, which Myatt certainly does not have. Myatt would obviously do his best to avoid any back reflections which would be unwanted loss in his configuration, hence he does not have a Twyman Green configuration with partially reflecting arm end faces. Furthermore, claims 2, 3, 8, 11 and the remaining claims import the novel and inventive limitations of claim 1.

Claim 5 is rejected under 35 USC 103 (a) as being unpatenable over Myatt et al (US 6,621,580).

The examiner states that it would have been obvious for one having ordinary skill in the art to split the beams into two equal beams. The applicant respectfully disagrees. Myatt teaches an entirely different device. His device is not a Twyman Green interferometer and thus has different requirements. With only the teaching of Myatt et al. in hand, absent the applicant's teaching, one would not have been directed to construct the device defined in claim 5 below:

> 5. An interferometer comprising a beam splitter and combiner for splitting an input beam into two sub-beams and for combing two sub-beams into a single beam;
> a first arm having a length l_1 optically coupled to the beam splitter and combiner, said first arm defining a first path within a first material having a refractive index n_1 and a coefficient of expansion α_1; and,
> a second arm having a length l_2 optically coupled with the beam splitter and combiner, said second arm defining a second path within a second material having a refractive index n_2 and a coefficient of expansion α_2 wherein the

lengths of the two arms are selected such that they satisfy the equation:

$$l_1\left[n_1\alpha_1+\frac{dn_1}{dT}\right]-l_2\left[n_2\alpha_2+\frac{dn_2}{dT}\right]=0$$

, wherein the interferometer is at least substantially athermal, and wherein the beam splitter and combiner is coupled to inner end faces of the first and second arm, in a Twyman-Green configuration, wherein an outer end face of the first arm and an outer end face of the second arm are at least partially reflecting, wherein a monitoring port is provided for receiving light transmitted through at least one of the two partially reflecting end faces, AND wherein the beam splitter and combiner splits an input beam incident thereon into two substantially equal beams.

This claim 5 is certainly not obvious over the teaching of Myatt et al. being absent at least of all of the underlined features in claim 5 (above).

In summary, the applicant is of the view that the Myatt et al. reference has no bearing on the patentability of the claims defined herein, and reconsideration of the claims as originally filed is respectfully requested.

Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

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MODAVIS
Serial No. **10/629,446**
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Respectfully submitted,

CHARLES E. WANDS
Registration No. 25,649
Customer No. 27975

Telephone: (321) 725-4760
NT/ara

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IN THE DRAWINGS

Replace Figure 1 with new Figure 1 enclosed herewith.